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DISTINCTIVE FEATURE THEORY AND NASAL ASSIMILATION IN SPANISH.

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CERTAIN FEATURES IN THE MEXICAN PRONUNCIATION OF NASAL CONSONANTS ARE PRESENTED HERE AND LINGUISTIC GENERALIZATIONS ARE FORMULATED--FIRST IN TERMS OF A CURRENT THEORY OF UNIVERSAL PHONOLOGICAL DISTINCTIVE FEATURES, AND SECOND IN TERMS OF A REVISED DISTINCTIVE FEATURE FRAMEWORK INCORPORATING THE CHANGES PROPOSED BY CHOMSKY AND HALLE IN "THE SOUND PATTERNS OF ENGLISH." THE DATA WERE GATHERED FROM THE UNGUARDED, COMFORTABLY RAPID SPEECH OF SEVERAL INFORMANTS FROM MEXICO CITY. THEY INDICATE THAT THERE IS COMPLETE NEUTRALIZATION OF NASALS BEFORE OBSTRUENTS (ONLY HOMORGANIC CLUSTERS OCCUR) WITH THE APPARENT EXCEPTION OF "N" PLUS "CH" (AS IN "UN CHARCO"). IN THIS POSITION A NASAL OCCURS WHICH IS NOT THE EXPECTED PALATAL BUT RATHER "AUDITORILY INDISTINGUISHABLE" FROM THE ALVEOLAR "N" OCCURRING IN "UN SACO." SEVERAL ATTEMPTS ARE MADE TO FORMULATE PHONOLOGICAL RULES BASED ON THE TRADITIONAL FOUR PRIMARY POINTS OF ARTICULATION CHARACTERIZED BY THE TWO FEATURES "DIFFUSE" AND "GRAVE." IN EVERY CASE THESE ATTEMPTS ARE CONSIDERED UNSATISFACTORY. THE REVISED FORMULATION OF CHOMSKY AND HALLE, HOWEVER, SUCCEEDS IN CHARACTERIZING IN ONE SIMPLE RULE SEVEN DISTINCT NASALS, INCLUDING A PALATO-ALVEOLAR WITH THE SAME FEATURES AS "CH." IT IS FELT THAT THE FACTS PRESENTED IN THIS PAPER LEND CLEAR SUPPORT TO CHOMSKY AND HALLE'S PROPOSALS AS SIGNIFICANT INNOVATIONS IN DISTINCTIVE FEATURE THEORY. THIS PAPER WAS PRESENTED AT THE THIRTEENTH ANNUAL NATIONAL CONFERENCE IN LINGUISTICS SPONSORED BY THE LINGUISTIC CIRCLE OF NEW YORK, NEW YORK CITY, MARCH 10, 1968. (JD)

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DISTINCTIVE FEATURE THEORY AND NASAL ASSIMILATION IN SPANISH

James W. Harris

1. Introduction

In The Sound Pattern of English[1] Chomsky and Halle have proposed certain changes in the current theory of universal phonological distinctive features. The question of the correctness of these changes is an empirical one, to be answered on the basis of facts drawn from the widest possible range of languages. The object of this paper is to examine a small set of facts from a language not considered by Chomsky and Halle in formulating their revised feature framework in order to confront their proposals with new empirical data.

The discussion will proceed as follows. First, certain of Chomsky and Halle's changes will be presented and discussed very briefly. Then a set of facts regarding Spanish pronunciation will be given in some detail. (This section holds some interest independent of the theoretical discussion in that the stated facts are frequently misrepresented in the literature.) Certain of the linguistic generalizations which can be extracted from these data will be formulated first in terms of the set of features which does not incorporate the changes proposed by Chomsky and Halle and then in terms of the revised set. Conclusions will be drawn regarding the relative empirical adequacy of the two theories with respect to the data considered.

2. Two sets of features

Prior to the theoretical revision under discussion, the traditional four primary points of articulation for consonants were characterized by the two features "diffuse" and "grave" as illustrated with various obstruents in (1).

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(1)	Labial	Dental	Palatal	Velar
	[p b f v]	[t d ts θ]	[č ǰ k_1 ç]	[k g x γ]
diffuse	+	+	-	-
grave	+	-	-	+

On the basis of a wide variety of facts from many languages, Chomsky and Halle have now proposed that (1) be replaced by (2):

(2)	Bi-labial	Labio-dental	Dental	Alve-olar	Palato-alveolar	Palato-velar	Velar
	[p b ϕ]	[f v]	[t θ]	[ť š]	[č š]	[k_1 ç]	[k x]
coronal	-	-	+	+	+	-	-
anterior	+	+	+	+	-	-	-
back	-	-	-	-	-	-	+
distributed	+	-	+	-	+	+	+

In both feature frameworks, of course, distinctions other than those of consonantal point-of-articulation are made in terms of other features, such as "continuant," "strident." Furthermore, the need is recognized for specification of phonetic detail by rules in which coefficients of features are integers rather than plus or minus.[2]

There is no need here for a full explication of the new features in (2) (see Chapter 7 of The Sound Pattern of English for a full discussion), but certain points should be noted. The first three features listed--"coronal," "anterior," and "back"--make the same distinctions as in (1) except that the palatals of (1) are now split into palato-alveolars and palato-velars in (2), the former sharing the feature [+coronal] with the dentals and alveolars and the latter sharing the features [-coronal] and [-anterior] with the velars. This distinction is correlated both with acoustico-articulatory properties and with the systematic role of features in phonological rules.

3. The data from Spanish

In the speech of Mexico City--more precisely, in the speech of a few Mexican friends of mine whom I believe to be typical--m, n, and (palatal) ñ occur distinctively before vowels: cama, "bed"; cana, "gray hair"; caña, "cane." Unassimilated n--that is, before a vowel and before pause--is alveolar [ň], not dental [n]: aňoňadaň. Labiodental [m̌], dental [n], and velar [ŋ] occur only as the result of assimilation. The assimilations of n which occur in unguarded, comfortably rapid speech are summarized in (3)[3] by showing the various phonetic realizations of the indefinite article un, which occurs as [uň] before vowels. For convenience, standard orthography is used except for nasals.

(3)

Nasal before:	Bilabial	Labio-dental	Dental	Alveolar	Palatal	Velar
	um peso	um̌ foco	un tío	uň saco	uǹ charco	uŋ cacto
	um beso		un día			uŋ gato
						uŋ juego ([uŋxweɣo])

In the sense that [p b f t d s č k g x] are the only obstruents that occur after nasals, (3) is exhaustive. It is immediately obvious that there is complete neutralization of nasals before obstruents--that is, only homorganic clusters of nasal plus obstruent occur--with the apparent exception of the cluster nch. Strikingly, the nasal which occurs before palatal [č] is not the expected palatal [ñ], although, as noted above, the phonetic inventory of the dialect does include [ñ]. Instead in this position we find a nasal (represented by the noncommittal symbol [ǹ]) which is auditorily indistinguishable from alveolar [ň] and quite different from [ñ].

Articulatorily, the tongue tip makes contact with the alveolae, just as it does for [n̆] but not for [ñ]. However, the area of lingual contact extends slightly farther back for [n̂] than for [n̆], though not so far back as the dorso-palatal contact of [ñ]. Informants uniformly assert that the nasal before [č] is n (and, furthermore, that the cluster [n̂č] is impossible). Thus, on three counts--auditorily, articulatorily, and intuitively for native speakers--the nasal which occurs before [č] cannot be identified as palatal [ñ].[4]

Let us go on to additional data which must be taken into account. Consider sets of words such as the following:

(4)

consu[m]ir, "to consume"	consu[n̆s]ión, "consumption"	consu[nt]o, "consume
presu[m]ir, "to presume"	presu[n̆s]ión, "presumption"	presu[nt]ivo, "presumptive"
redi[m]ir, "to redeem"	rede[n̆s]ión, "redemption"	rede[nt]or, "redeeme

Evidently these words have the stems consum-, presum-, and redem-, the final m of which appears as alveolar [n̆] or dental [n] before an affix beginning with an alveolar or dental obstruent. (The vowel alternation can be handled by a very general rule.)

Consider finally the following sets of words:

(5)

te[ñ]ir, "to tinge, dye"	ti[nt]e, "tinge, dye"	ti[nt]ura, "tincture, d
ce[ñ]ir, "to gird(le)"	ci[nt]o, "belt, girdle"	ci[nt]ura, "waist, gird
he[ñ]ir, "to knead"	hi[nt]ero, "baker's kneading board or table"	

These words seem to have the stems tiñ-, ciñ-, and hiñ-, with the final ñ appearing as dental [n] before an affix beginning with a dental obstruent. (It should be pointed out, however, that considerations irrelevant to the present discussion make this assumption less clear than that

regarding the m - ň/n alternation of the previous paragraph. The vowel alternations can again be handled by very general rules.)

4. Generalizations.

Let us now use the features of (1) to formulate phonological rules which state the generalizations which can be extracted from the data of Section 3.

With the features of (1), four nasals can be distinguished as in (6):

(6)

	Labial	Dental	Palatal	Velar
	m	n	ñ	ŋ
diffuse	+	+	-	-
grave	+	-	-	+

In accordance with the description given in Section 3, the nasal which occurs before [č] must be assigned the features [+diffuse, -grave], distinct from [ñ]. Putting aside for the moment the fact that there is no way of distinguishing between bilabial [m] and labiodental [m̌] or between dental [n] and alveolar [ň], the problem is how to formulate a rule which correctly captures the gross generalization illustrated by the data of (3), namely, that n assimilates to the point of articulation of following obstruents except [č]. Ignoring boundaries so as not to overburden the exposition, we may propose rule (7):

(7)

$$n \rightarrow \begin{bmatrix} \alpha\text{diffuse} \\ +\text{grave} \end{bmatrix} / __ \begin{bmatrix} +\text{obstruent} \\ \alpha\text{diffuse} \\ +\text{grave} \end{bmatrix}$$

Now, to accommodate the data of (4) we must add rule (8):

(8)

$$m \rightarrow [-\text{grave}] \quad / __ \begin{bmatrix} +\text{obstruent} \\ -\text{grave} \end{bmatrix}$$

Further, if the suggestions regarding (5) are correct, we must also add (9

(9) $$\tilde{n} \rightarrow [+\text{diffuse}] \; / \; __ \; \begin{bmatrix} +\text{obstruent} \\ +\text{diffuse} \end{bmatrix}$$

We have now covered the data, but unsatisfactorily. The three rules (7), (8), and (9), by virtue of being three rules rather than one, still fail to state the generalization that any nasal assimilates to the point of articulation of a following obstruent except [č]. To put it slightly differently, a grammar containing the three separate rules (7), (8), and (9) makes, in effect, the false claim that there are three independent, unrelated processes of nasal assimilation involved in the data presented. Such a grammar would fail to distinguish between the natural assimilations illustrated here and the entirely unnatural situation of, say, n becoming [ŋ] before dentals, m becoming [ñ] before labials, and ñ becoming [m] before velars: in this hypothetical case there is no generalization and three separate rules are required. In order to formalize the obvious generalization in the present data, rules (7), (8), and (9) can be collapsed into one rule (schema) with fewer features than the three rules stated separately. One might resort to a number of artifices to do this, as in rule (10):

(10) $$[+\text{nasal}] \rightarrow \left\{ \begin{array}{ll} [-\text{next rule}] \; / \; __ \; \begin{bmatrix} -\text{diffuse} \\ -\text{grave} \end{bmatrix} & \text{(a)} \\ \begin{bmatrix} \alpha\text{diffuse} \\ \beta\text{grave} \end{bmatrix} \; / \; __ \; \begin{bmatrix} +\text{obstruent} \\ \alpha\text{diffuse} \\ \beta\text{grave} \end{bmatrix} & \text{(b)} \end{array} \right.$$

Part (a) exempts nasals from part (b) before [č], among other environments; part (b) states the desired generalization that all other nasals must agree in diffuseness and gravity with a following obstruent. There are, however, at least two difficulties with rule (10). First, use of the device [-next rule] is rather suspect on theoretical grounds.[5]

Second, and perhaps more importantly, (10) does not rule out the occurrence of [mč], [ñč], and [ŋč], which not only do not occur, but are in fact impermissible sequences rather than fortuitous gaps. Thus an ad hoc statement to this effect would have to be added to a grammar containing (10).

These difficulties are avoided in a formulation such as (11):

(11)
$$[+\text{nasal}] \rightarrow \begin{bmatrix} \alpha\text{diffuse} \\ \beta\text{grave} \end{bmatrix} / __ \begin{bmatrix} +\text{obstruent} \\ \gamma\text{diffuse} \\ \beta\text{grave} \end{bmatrix}$$

Conditions: if $\gamma=\beta$, then $\alpha=+$
$\gamma\neq\beta$ $\alpha=\gamma$

However, the set of conditions on (11) are extremely complex for an otherwise simple rule. It would be, as far as I know, the only rule of Spanish phonology with "if-then" conditions at all.

Let us turn now to the set of features in (2), which enable us to characterize seven distinct nasals as in (12):

(12)

	Bi-labial m	Labio-dental m̆	Dental n	Alveolar n̆	Palato-alveolar n̂	Palato-velar ñ	Velar ŋ
coronal	-	-	+	+	+	-	-
anterior	+	+	+	+	-	-	-
back	-	-	-	-	-	-	+
distributed	+	-	+	-	+	+	+

The revised set of features not only allows us to distinguish [m] from [m̆] and [n] from [n̆], but also makes available a palato-alveolar nasal, distinct from both [ñ] and [n̆], with the same features as [č]. The acoustico-articulatory description of the nasal before [č] given in Section 3 leaves no room for doubt that this nasal should be assigned the features given for [n̂] in (12).[6] Thus we may now state the rule of nasal assimilation as (13):

(13)
$$[+\text{nasal}] \rightarrow \begin{bmatrix} \alpha\text{coronal} \\ \beta\text{anterior} \\ \gamma\text{back} \\ \delta\text{distributed} \end{bmatrix} / __ \begin{bmatrix} +\text{obstruent} \\ \alpha\text{coronal} \\ \beta\text{anterior} \\ \gamma\text{back} \\ \delta\text{distributed} \end{bmatrix}$$

Rule (13) states simply that only homorganic clusters of nasal plus obstruent occur.

Comparison of rules (10) and (11) with rule (13) shows that the relatively small and straightforward set of data presented provides rather strong support for Chomsky and Halle's revision of distinctive feature theory. First of all, with the features of (2), there is no way of distinguishing between bilabial [m] and labiodental [m̆] or between dental [n] and alveolar [n̆], although the data demand that these distinctions be made if even a moderate degree of phonetic accuracy is to be achieved. But this is a relatively minor problem which might be disposed of by relegating it to the limbo of phonetic-detail rules in which the coefficients of features are integers rather than plus or minus. These distinctions are made available in the theory which includes (12) by use of the feature "distributed," but this is a trivial gain: the increase in the number of phonetic distinctions available is simply a consequence of the increase in the number of parameters in the system--exactly what one would expect. This gain is offset by a serious loss, namely, that of the strength of the claims made about language: the extremely restrictive, and hence interesting, claim that all languages operate with only four significant points of articulation for consonants has been abandoned. The real gain in the theoretical revision under discussion is not that certain phonetic distinctions can be made without the use of integral feature coefficients, but rather that the straightforward process of nasal

assimilation can be described in one simple rule which requires neither devices like [-next rule] nor complex"if-then" conditions, both of which are extremely powerful and must be severely constrained. Furthermore, the nonoccurrence of [mč], [ñč], and [ŋč] is not only accounted for by rule (13) but is in fact explained. Even if there were no [č] in the language, rule (13) would still have to be stated exactly as it is, feature by feature. Thus this rule automatically predicts the quality of the nasal which does in fact occur before [č]. This situation stands in sharp contrast to that of rules (10) and (11), where the difficulties are caused solely by the existence of [č].

Finally, it is important to bear in mind that Spanish was not included in the very wide range of languages on the basis of which the theoretical changes under discussion were proposed. Linguistic theory is obviously not advanced greatly by making ad hoc adjustments every time some recalcitrant fact turns up in a language not previously investigated. Any theoretical innovation constitutes a prediction that data not yet considered will contain generalizations which can be captured in the revised framework but not in the former framework. Only when such predictions are borne out can we feel that progress has been made. The facts presented here thus lend particularly clear support to certain of Chomsky and Halle's proposals as significant innovations in distinctive feature theory.

Notes

1. N. Chomsky and M. Halle (New York, 1968), Chapter 7.

2. Some discussion of integral feature values may be found in N. Chomsky and M. Halle, The Sound Pattern of English (New York, 1968), 65, 313; P. Postal, Aspects of Phonological Theory (New York, 1968), 65 ff.

3. The data are somewhat different for a more deliberate style of speech. A discussion of the impressionistic terms "style" and "stylistic level" in phonology, along with tentative suggestions concerning formal correlates of these terms in the properties of phonological rules of Spanish, can be found in J. W. Harris, Spanish Phonology (forthcoming), Chapter 2.

4. The literature abounds in statements to the effect that [ñ] does in fact occur before [č]. See, for example, T. Navarro Tomás, Manual de pronunciación española (Madrid, 1965), 133; E. Alarcos Llorach, Fonología española (Madrid, 1961), 175 f; J. Sableski, A Generative Phonology of a Spanish Dialect (Seattle, 1965), 32; S. Saporta and H. Contreras, A Phonological Grammar of Spanish (Seattle, 1962), 30 ff; R. Stockwell and J. Bowen, The Sounds of English and Spanish (Chicago, 1965), 83; J. Foley, Spanish Morphology (unpublished Doctoral dissertation, M.I.T), 27; J. Campbell, A Sketch of Spanish Phonology (unpublished paper, Indiana University), 27 ff. These references, however, describe some dialect other than that of Mexico City, or they give descriptions which are presumably valid across dialects. On the other hand, H. King,"Outline of Mexican Spanish Phonology," Studies in Linguistics, 10 (1952), 51-62, states explicitly that the same

nasal allophone occurs before [c̆] as before [s]. We return briefly to the question of other dialects in note 6.

5. See N. Chomsky and M. Halle, The Sound Pattern of English (New York, 1968), Chapter 4, Section 2.2, and Chapter 8, Section 7, for discussion.

6. In 1939 George Trager observed in "The Phonemes of Castilian Spanish," Travaux du cercle linguistique de Prague, 217-222, that "n̲ is ... alveolopalatal ([n̂], different from [ñ]) before c̆ ... ñ̲ is prepalatal with no apicalization" (p. 219). With the possible exception of a much less clear statement by I. Silva-Fuenzalida, "Estudio fonológico del español de Chile, Boletín de filología, VII (1952), 160, Trager's observation is, to my knowledge, unique in the literature. However, given (12), one would be led to view with extreme suspicion any description of Spanish nasals at variance with that given in Section 3. That is, it seems to me extremely likely that all dialects of Spanish have [n̂] before [c̆], the references in (4) notwithstanding.